U.S. Department of
Federal Aviation Administration

Aeromedical Research Resume
Research Project Initiative Subtask for FY00

1. Title:	2. Sponsoring Organization/Focal Point:	3. Originator Name, Organization
Clinical Research in Support of Aircraft Accident Analyses	AAI-1: D. Thomas AAM-1: Dr. Jon Jordan	Dennis V. Canfield, Ph.D. AAM-610, Civil Aeromedical Institute (405) 954-6252
		4. Origination Date: March 3, 1999 Start Date: Oct. 1, 2000
5. Parent RPI Number: 3	6. Subtask Number: AM-B-00-TOX-203	7. Completion Date: September 30, 2002
8. Parent MNS: Aeromedical Research (159)	9. RPI Manager Name, Organization, Phone: Dennis V. Canfield, Ph.D. AAM-600, FAA, CAMI (405) 954-6252	Dennis V. Canfield, Ph.D. AAM-610, FAA, CAMI (405) 954-6252

10. Research Objective(s):

To maintain a research aeromedical response team for aircraft accidents, maintain medical databases which will allow data driven decision making regarding clinical topics of relevance to the FAA such as: comparison of FAA medical certification with international practices, special issuance of airman certification policies, certification requirements for pilot vision, pilot incapacitation incidence data, in-flight medical care provision, medical kits, crashworthy and cabin safety survival factors, and other human factors concerns. Assist the FAA in determining aircraft crashworthiness and the predominant effects which occur in the postcrash environment by evaluation of autopsy information. The collection and preservation of data in a computerized searchable form of mishaps and pilot incapacitations of relevance to clinical decision making in OAM. Data will be evaluated from accident investigation and incident systems (e.g., FAA, DOD, NASA, and NTSB) as well as collected from on-scene or consultative participation with FAA, NTSB and other national sources. The evaluation of airman certification standards will be made using the relationship of accident/incidents and the known medical status of involved airmen. Consultation services, based on research data, to the FAA, NTSB, and other interested parties will be improved through continuous quality assurance.

11. Technical Summary:

Epidemiological methods will be applied to aircraft mishap data to examine possible roles of medical factors or stresses of flight that might lead to in-flight sudden and subtle incapacitation, such as due to (sudden) heart attack in-flight or (subtle) spatial disorientation.

A national program of data forwarding from the FAA regions to CAMI allows quality assurance, collation and database entry by the Aircraft Accident Research Team. Using mortality and morbidity data from autopsy and accident reports, a database of cause of death and associated injuries has been created for use in aviation safety improvement. The tracking of pilot incapacitations allows the centralized creation of incapacity and impairment incidence data for the NAS. Partnering with industry has allowed data from in-flight medical events to be entered into a medical kit utilization database to help in questions regarding the contents and functioning of the mandated medical kits. The data collection is coupled with monthly meetings with the Aeromedical Certification Division to permit rapid exchange of information about recent occurrences.

Participation in mishap investigation allows the collection of information about aircraft crashworthiness or cabin safety aspects relating to evacuations. Information obtained from postcrash investigations (autopsies, toxicological reports, interviews, flight data records (FDRs) will be correlated to determine the predominant medical and human factors in the cause of injuries/deaths, the effectiveness of evacuation systems, the effectiveness of medical equipment onboard civilian aircraft, and the post impact crashworthiness aspects. Accident and incident site participation at the request of the FAA Office of Accident Investigation is a critical facet of this research. Select in-house research on other clinical and human factors (e.g., vision pathology) will be done to enhance the understanding of accident/incident scenarios and to develop aeromedical guidance materials for regulators, pilots and investigators.

12. Resources Requirements:	FY00	FY01	FY02		

FAA Staff Years	11	11	11		

13. Description of Work:

(1) Brief Background

The Aircraft Accident Research Team established at CAMI is a leading edge consult and research unit employing a wide range of disciplines which are used in virtually all major air disasters. Several reviews regarding in-flight sudden incapacitation, medical kit utilization patterns, and special issuance pilot mishaps have been conducted. Special skills in the determination of situational awareness, specifically spatial disorientation, have been useful in determining the cause of aviation accidents. Many outreach activities have occurred to disseminate the research findings at aviation safety meetings in the U.S. and elsewhere in the world.

The projects will examine the following concepts and/ or null hypotheses:

(i) Demographic and clinical information for commercial airmen who experience incapacitation, as a group, will not differ from the general airmen population, analyzed for a variety of descriptors;

(ii) Special issuance pilots' mishap rates and causes compared to the overall mishap rate will not be statistically different;

(iii) Part 121 aviation medical kit contents are effective in dealing with most serious in-flight medical emergencies;

(iv) Injury patterns and medical conditions found in autopsies can be used to provide descriptive information to improve aviation safety and medical certification;

(v) Visual issues affecting pilots such as glare, ocular surgeries, and refractive error correction procedures are properly certified using present certification standards.

(vi) There is no increased risk of an aviation accident from high intensity light sources at laser light shows and sports stadiums using present FAA regulation.

The research will incorporate investigation of selected accidents at the request of AAI and the NTSB. The team's emphasis is on those factors associated with medical and human performance concerns, such as in-flight incapacitation or impairment. The effect of glare on vision performance will be evaluated in both normal and visually compromised test subjects under conditions of actual and/or simulated flying conditions. Epidemiological research will rely on regular updating of the consolidated database (CDB) and enhancement of the query interface. CAMI will work with industry and academic partners using voluntary and cooperative research development agreements (CRDA) to broaden the team's information gathering and dissemination abilities.

14. Intended End Products / Deliverables:

Note: the outcomes tracked within this research program are often rare catastrophic events requiring lengthy follow up.

A report on the medical kit utilization study will be submitted to assist in the development of standards for medical kit design and use. This report will help in preventing diversions and help prevent catastrophic out comes in medical emergencies on board aircraft. A report on the utilization of automated external defibrillators in aircraft will be provided to assist in determining the effectiveness of automated external defibrillators in preventing diversions and saving lives. This report will help the FAA in developing regulations regarding the use of the these devices on aircraft. A report on the mishap experience of pilots with special medical circumstances will be provided to aid in developing medical certification standards, which will protect the rights of the pilot and assure the safety of the pilot and the public. Annual recommendations will be made based on ongoing assessments of the medical data to aid in the development of standards (and associated testing methods) for medical certification and safety recommendations in regards to aircraft design factors. Criteria will be established for regulating high intensity light sources, which will prevent unnecessary regulation and assure the safety of the public. Recommendation will be made for the use of new methods of vision correction for civilian airmen, which will aid pilots in making informed choices in regards to vision correction and will provide maximum safety to the pilot and the public.

15. Schedule/Milestones:	***FY00***	***FY01***	***FY02***
Respond to all AAI/NTSB requests for analytical assistance.	Continuous	Continuous	Continuous
Evaluate accident research data for injuries and medical conditions, which may be affected by aircraft configuration or medical certification.	Continuous	Continuous	Continuous
Report of special autopsy project (comparing '91-'98 fatalities data).	Q1		
Development of CAD/CAM accident database with TSB - Canada	Q4		
Protocol		Q1	
Interim report			Q1
Forensic product			
Categorizations of pilot incapacitations			Q3
Influence of changes in medical certification standards - data			
Evaluation of mishap experience of special medical certificated pilots – protocol	Q2 Q1		
Data Collection			Q1
Report	Q1		
Report of MedAire emergency medical kit evaluation			
Aviation Medical Assistance Act in-flight death study	Q1		
Report			
Evaluation of SODA pilots	Q3		
Data collection		Q1	
Guidelines manual			
Comparison of pilot medication usage with toxicology findings	Q1		
Protocol		Q2	
Data collection			Q3
Report			
Application of HFACS to general aviation accidents (with AAM-500) funded by NASA	Q1		
Preliminary accident report analysis		Q1	
Modify ASAFE algorithm for GA			Q3
Field test of revised algorithm			
Start collecting data on the visual incapacitation of pilots from high intensity glare sources	Q3		
Report on the visual incapacitation of pilots from high intensity glare sources		Q3	
		Q3	
Collect data for non-traditional methods of vision correction study			Q3
Report on non-traditional methods of vision correction study			

16. Procurement Strategy/Acquisition Approach/Technology Transfer:

Procurements anticipated in FY-00 follow standard acquisition strategies.

Update the Consolidated Data Base: 150K

17. Justification/History:

This research program is mandated by Congress in the Aviation Research Act of 1988 and of Public Law 103-272, the FAA Act. Several projects have reportables mandated by Congress in Aviation Medical Assistance Act of 1998. This project responds to the requirements of FAA Order 8025.1B of February 16, 1984 (and modifications) which establishes the responsibilities of OAM to administer a program to investigate the medical and human factors causes of aircraft accidents. The FAA report on accident investigation (July 1988, Office of Program and Resource Management, and the OAM) strongly recommended improved medical support of aircraft accident investigations. This project is in compliance with PUBLIC LAW 100-591 (H.R.4686); November 3, 1988. This project is coordinated with the FAA Research, Engineering, and Development (RE&D) Plan, and directly supports the Bioaeronautics portion of the National Plan for Civil Aviation Human Factors.

18. Issues:
Select performance testing that requires human subject testing will incorporate separate protocols reviewed by the CAMI Institutional Review Board (IRB).

19. Transition Strategy:
Not applicable

21. R&D Teaming Arrangements:
Coordination will be carried out with the Office of Accident Investigation (AAI), the Office of the Chief Counsel (AGC), and the National Transportation Safety Board (NTSB). AAI represents the primary sponsor, and AAM, AGC, and NTSB, the primary users, for this research.

22. Special Facility Requirements:
Existing facilities and personnel of the Aircraft Accident Research Team as coordinated from CAMI adequately meet requirements for this project.

23. Approvals (Signature Authority):		***Name:***	***Performing Organization***
		Title:	
David F. Thomas, AAI-1	***Date***	***Date***	William E. Collins, Ph.D.
Nancy C. Lane, AIR-3	***Date***	***Date***	Director, FAA Civil Aeromedical Institute, AAM-3
Jon L. Jordan, M.D., AAM-1	***Date***		